

Laparoscopic Repair of a Posttraumatic Left-Sided Diaphragmatic Hernia Complicated by Strangulation and Colon Obstruction

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ABSTRACT

Background: Posttraumatic diaphragmatic hernias (PDH) are serious complications of blunt and penetrating abdominal or thoracic trauma. Traditional thoracic or abdominal operations are usually performed in these cases.

Methods: We present 2 cases of posttraumatic left-sided diaphragmatic hernia complicated by strangulation and colon obstruction. Both cases were successfully treated with laparoscopy.

Results: We found that laparoscopy is a safe, successful, and gentle procedure not only for diagnosis but also for treatment of complicated PDH. Strangulation and colon obstruction were not contraindications to performing laparoscopic procedures. The postoperative course and long-term follow-up (range, 12 to 30 months) were uneventful and short. We expect the same good long-term results after laparoscopic repair as after open conventional surgery.

Conclusion: We recommend the use a minimally invasive approach to treat posttraumatic diaphragmatic hernia complicated by strangulation and colon obstruction in hemodynamically stable patients.

Key Words: Laparoscopy, Posttraumatic diaphragmatic hernia, Strangulation, Colon obstruction.

INTRODUCTION

Posttraumatic diaphragmatic hernia (PDH) is a rare disease treated traditionally by using open thoracic or abdominal operations.¹⁻³ Only a few studies have reported the use of the laparoscopic technique for PDH.^{2,4-6} However, this procedure has not been described for the treatment of PDH complicated by strangulation and bowel obstruction. Herein, we report on 2 cases of successful laparoscopic repair of posttraumatic left-side diaphragmatic hernia complicated by strangulation and colon obstruction.

CASE REPORTS

Case #1

A 40-year-old man was admitted to our hospital with complaints of cramps around the epigastric area and throughout the abdomen, nausea, a feeling of bloating, and constipation. The patient had a traffic accident 12 years earlier with fracture of the left 8 to 10 ribs and hemothorax that was resolved by pleural draining. Computed tomography scan (CT) showed migration of the large intestine and greater omentum into the left hemithorax and acute colon obstruction (**Figure 1**). On the same day, laparoscopic surgery was performed. A 3-trocar technique was used.

Diagnostic laparoscopy had shown an insignificant amount of serous liquid in the lateral compartments of the peritoneal cavity and pelvis, dilated ileum, and the right hemicolon. Posttraumatic hernia with bowel obstruction and strangulated greater omentum and left transverse colonic segment, surrounded by cicatricial adhesions, was revealed in the left dome of the diaphragm (**Figure 2**). The transverse colonic segment and part of the greater omentum were dislocated into the left thoracic cavity. The following stage was laparoscopic limited to the zone of operative intervention. The strangle ring was dissected in a radial direction, and released colon and omentum were pulled down into the abdominal cavity. The colon was freed meticulously from adhesions and strangulation to avoid bowel wall injury. Because pneumothorax is the natural stage of this kind of surgery, pneumoperitoneum

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Figure 1. Computed tomography scan of the chest and abdominal cavity in a case of posttraumatic left-sided diaphragmatic hernia complicated by strangulation and colon obstruction.

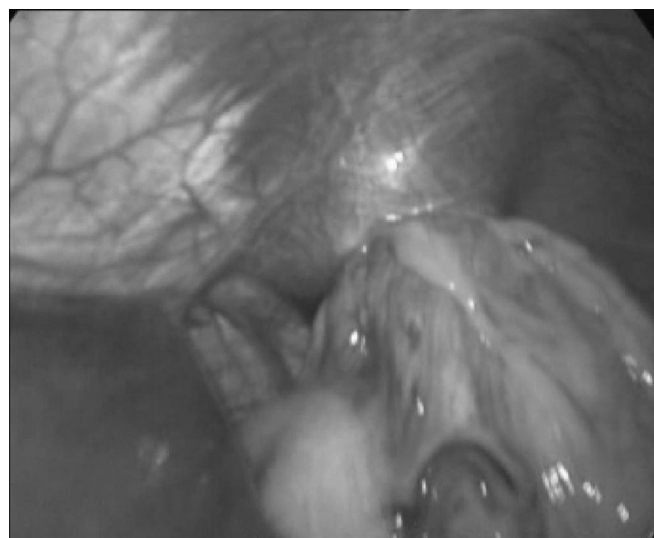


Figure 2. Diagnostic laparoscopic procedure of posttraumatic left-sided diaphragmatic hernia complicated by strangulation and colon obstruction.



Figure 3. Suturing of the diaphragm defect.

pressure was lowered to between 7mm Hg and 8mm Hg before the restrained organs was freed. A 25-mm x 30-mm rupture of the left diaphragm dome surrounded by scar tissue was found (**Figure 2**). The diaphragm defect was cleared from a cicatricial tissue and closed with separate intracorporeal nonabsorbable suture in 2 rows (**Figure 3**). The released part of the colon was examined for viability, with intracorporeal suturing of the strangulated zone, and then resection of the greater omentum was performed. The surgery was completed by draining the left subdiaphragmatic space and left pleural cavity. The operation time was 210 minutes, and estimated blood loss was

150mL. Drains were removed on the next day after surgery. The postoperative recovery was uneventful. Spontaneous bowel movements occurred on the second day after surgery. The patient returned to work on the eighth postoperative day. X-ray controls 2 months and 30 months after surgery showed no defects in the diaphragm.

Case #2

A 46-year-old man was delivered to our hospital complaining on periodic spasmodic epigastric pain accompanied by constipation, bloating, and nausea that resolved after conservative therapy. The patient had undergone surgery for a stab wound to the chest with injury to the heart 5 months before admission.

The frontal and lateral chest X-rays revealed the transverse colonic segment dislocated into the left thoracic cavity above the diaphragm (**Figure 4**). The left-sided posttraumatic diaphragmatic hernia was recognized. Surgery was proposed, but the patient refused it.

He was rehospitalized 3 weeks later with complaints of abdominal cramps, nausea, vomiting, absence of stool and gas for 2 days. X-ray examination demonstrated a posttraumatic left-sided diaphragmatic hernia complicated by strangulation and acute colon obstruction (**Figure 5**). Conservative therapy for 4 hours was ineffective, and laparoscopic surgery was performed. The approaches, surgical findings, and laparoscopic technique were about the same as in the previous clinical case. The operation time was 90 minutes, and estimated blood loss was 100mL. Drains were removed on the next day after surgery. Spontaneous passage of stool occurred on the second postoperative day. The postoperative recovery was uneventful. The patient was discharged on the fourth day and returned to work on postoperative day 6. There were no defects in the diaphragm on X-ray controls 2, 7, and 12 months after treatment.

DISCUSSION

PDH is a displacement of internal abdominal organs to a chest cavity through a pathological aperture of a diaphragm due to the trauma.^{1,3,6} Because PDH does not always have a hernial sack, some authors use the term “false hernia.” However, the presence or absence of a hernia sack has only a little impact on the clinical course and medical tactics, and the term “posttraumatic diaphragmatic hernia” is generally accepted in the medical literature.^{1,3}

Diagnosis of PDH often might be delayed, especially if the existence of diaphragm damage has not been es-

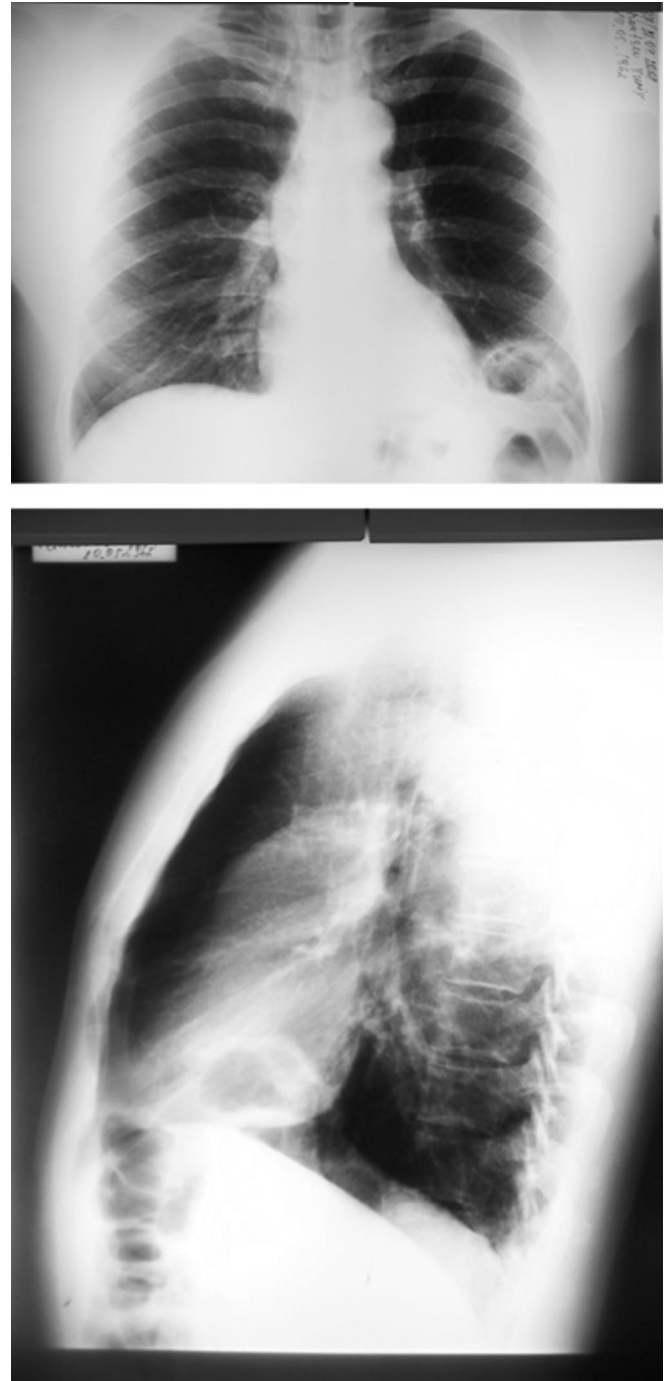


Figure 4. Chest x-ray of the second patient with posttraumatic left-sided diaphragmatic hernia.

tablished in the acute period of a trauma.^{1-3,7} The severe diagnostic problems are caused by development of PDH strangulation and acute bowel occlusion.⁷ Our experience clearly demonstrates a rare but identical pathology of the diaphragm



Figure 5. X-ray contrast abdominal cavity examination of the second patient with posttraumatic left-side diaphragmatic hernia complicated by strangulation and colon obstruction.

that led to complications by strangulation and bowel obstruction.

Operative interventions for diaphragm pathology are considered among the most difficult reconstructive surgeries.^{1,3} Results depend on the kind of disease, its complications, the intensity of pathological changes in a diaphragm and surrounding organs, the surgical approach, and the extent of operating trauma.¹ For this reason, particular attention is paid to PDH repair.^{1,5,8}

The evolution of minimally invasive surgery has allowed surgeons to challenge various traditional approaches.^{6,8} Although the laparoscopic treatment of hiatal hernia is a standard operation in daily surgical practice, the use of laparoscopic techniques for PDH is still rare.^{2,4–6,9} However, the possibility of laparoscopic surgery for complicated PDH remains disputable.^{3,4}

All patients with possible diaphragm damage and recurrence of pulmonary dysfunction or intestinal symptoms, such as obstruction, nausea, and pain, should be investigated for PDH.

Laparoscopy in addition to X-ray examination and CT scan is the final and most valuable diagnostic procedure for PDH, allowing development of a suitable individual surgical approach. Because pneumothorax is the natural stage of PDH laparoscopic repair, it is recommended that it be reduced to 7mm Hg to 8mm Hg to avoid thoracic organ compression. The

surgeon developing laparoscopic procedures for strangulated PDH with bowel obstruction should be ready to convert to a traditional operation at any moment.

CONCLUSION

Our experience shows that laparoscopy is a safe, effective, minimally invasive method of treatment for PDH complicated by strangulation and colon obstruction. Strangulation and colon obstruction are not contraindications to the use of laparoscopic techniques in the treatment of PDH. Laparoscopic repair of complicated PDH is technically challenging and time consuming. However, we suppose that surgeons with sufficient experience in laparoscopy can use a minimally invasive approach in these cases for hemodynamically stable patients.

References:

1. Crandall M, Popowich D, Shapiro M, West M. Posttraumatic hernias: historical overview and review of the literature. *Am Surg.* 2007;73(9):845–850.
2. Kuhn R, Schubert D, St Wolff, Marusch F, Lippert H, Pross M. Repair of diaphragmatic rupture by laparoscopic implantation of a polytetrafluoroethylene patch. *Surg Endosc.* 2002;16(10):1495–1495.
3. Ruiz-Tovar J, Calero García P, Morales Castiñeiras V, Martínez Molina E. Post trauma diaphragmatic hernia. *Rev Gastroenterol Peru.* 2008;28(3):244–247.
4. Baldassarre E, Valenti G, Gambino M, et al. The role of laparoscopy in the diagnosis and the treatment of missed diaphragmatic hernia after penetrating trauma. *J Laparoendosc Adv Surg Tech A.* 2007;17(3):302–306.
5. Cueto J, Vázquez-Frías JA, Nevarez R, et al. Laparoscopic repair of traumatic diaphragmatic hernia. *Surg Laparosc Endosc Percutan Tech.* 2001;11(3):209–212.
6. Meyer G, Hüttel TP, Hatz RA, Schildberg FW. Laparoscopic repair of traumatic diaphragmatic hernias. *Surg Endosc.* 2000;14(11):1010–1014.
7. Galimberti A, Casagrande A, Compagnoni BM, et al. Late post-traumatic diaphragmatic hernia: unusual cause of colonic occlusion. *Chir Ital.* 2001;53(4):551–514.
8. Ikeya T, Sugiyama S, Koyama S, Hara H, Doki Y, Misaki T. Traumatic diaphragmatic hernia repaired by video-assisted thoracic surgery; report of two cases. *Kyobu Geka.* 2003;56(5):415–418.
9. Matthews BD, Bui H, Harold KL, et al. Laparoscopic repair of traumatic diaphragmatic injuries. *Surg Endosc.* 2003;17(2):254–258.